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ASSIGNMENT BOOKLET
SCN3240 Chemistry 30
Module 1 Assignment

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Chemistry 30

Learn = veryWare

we explore

Thinking Energy

Module 1

Assignment Booklet

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Summary

	Total Possible Marks	Your Mark
Lesson 1 Assignment		
Lesson 2 Assignment		
Lesson 3 Assignment		
Lesson 4 Assignment		
Lesson 5 Assignment		
Lesson 6 Assignment		
Lesson 7 Assignment		
Lesson 8 Assignment		

Teacher's Comments

Chemistry 30 Learn EveryWare
Module 1: Thinking Energy
Assignment Booklet
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Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

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Read all parts of each assignment carefully, and record your answers in the appropriate places. If you have difficulty with an assignment, review the relevant sections of the lesson and the textbook. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

MODULE 1: LESSON 1 ASSIGNMENT

Lesson 1 Assignment: Personal Energy Use

1. Prepare a spreadsheet that lists both the food and the total energy you consume during one day. Attach your completed spreadsheet to this document for submission to your teacher.

Consider the following headings for your chart:

- Time When Food Is Consumed
- Type of Food Consumed
- Approximate Mass or Volume of Food Consumed
- Energy Content of Each Type of Food Consumed
- Total Energy Consumed

You may wish to use the information on the chart "Approximate Energy Content of Foods" shown below as well as the data on the labels of products you consumed to calculate your total daily energy intake.

You may wish to check a more detailed list of the energy content in foods. For the purpose of your spreadsheet, record the energy in joules. If you need to convert a value from calories to joules, you will need to use the conversion equivalent of 1 calorie = 4.19 joules.

APPROXIMATE ENERGY CONTENT OF FOODS

Food	Serving Size	Approximate Energy Content (kJ)
Vegetables	• 1/2 cup vegetables • 1 cup salad	80
Fruit	• medium piece (e.g., apple, orange) • 2 smaller pieces (e.g., apricot)	350
Breads and Cereals	• slices of bread • 2/3 cup cooked rice or pasta	600
Dairy	• glass of skim milk • 125 mL low-fat yogurt • 40 g low-fat cheese	400
Meat	120 g raw lean meat or chicken	600
Healthy Fats	• 3 teaspoons margarine • 2 teaspoons oil • 1/2 tbsp avocado	350

	• 10 nuts	
Drinks	• 1 glass (250 mL) water or diet soft drink • 1 glass (250 mL) fruit juice	0 450

MODULE 1: LESSON 2 ASSIGNMENT

Lesson 2 Assignment: How Much Energy?

Part 1—Lesson 2 Lab: Calorimetry

1. Use the multimedia presentation for this lab to complete the following table:

mass of nut (g)	
mass of water (g)	
initial temperature of water (°C)	
final temperature of water (°C)	

a. Calculate how much energy was absorbed by the water.

2. The following questions appear on page 479 of the textbook.

a. Calculate how much energy was absorbed by the water.

b. Where did the nut's energy come from?

c. Calculate the quantity of energy produced per gram of fuel (nut) burned.

d. Compare this combustion reaction to the reaction that would happen if you were to eat the nut instead of burning it.

e. This experiment uses low-tech equipment. How can you improve on the technology and, therefore, improve on the certainty of the experimental results?

Part 2—Evaluate the Design of a Solar Panel

Use the diagram "Active Solar Heating System" in the Student Module Booklet to answer the questions in this section.

The solar panels found on the roofs of buildings within the Drake Landing Solar Community are part of an active solar heating system. The circulation of antifreeze solution through the system allows for the transfer of energy from the collector to the house, or to the borehole energy storage system.

Earlier in this lesson you learned about calorimeters, and you looked at the design of different calorimeters.

1. Examine the diagram of the solar panel. Identify similarities and differences between the design of the solar panel shown and the calorimeters you learned about in this lesson.

2. The antifreeze ethylene glycol is used in the solar collector instead of water. State two advantages and two disadvantages of using ethylene glycol instead of water. Support the advantages and disadvantages you identify by making reference to the physical properties, safety concerns, or chemical reactivity of both ethylene glycol and water.

MODULE 1: LESSON 3 ASSIGNMENT

Lesson 3 Assignment: Constructing and Testing a Calorimeter

1. Data

The table shows that a total of ten trials were completed. Use the data from your experiment or the data from the multimedia presentation, Lesson 3 Lab: Constructing and Testing a Calorimeter, to record the data for the first trial in this experiment.

	Trial									
Measurement	1	2	3	4	5	6	7	8	9	10
mass of empty calorimeter (g)		4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24
mass of calorimeter and cool water (g)		82.11	84.06	82.13	80.55	78.98	83.45	85.61	82.97	81.07
mass of cup and warm water (g)		55.54	58.77	58.42	56.89	57.06	55.87	54.65	58.44	56.05
mass of empty cup (g)		1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
initial temperature of calorimeter (°C)		23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1
initial temperature of warm water (°C)		68.5	69	65.5	64.5	70.2	66.7	64.9	61.8	67.8
final temperature of calorimeter (°C)		40.6	42.1	40.5	40.1	41.8	39.8	38.9	39.4	40.2

Analysis

LAB 1. Use the data in the table to calculate an average specific heat capacity for the warm water tested.

LAB 2. Compare the average you obtained in LAB 1 to the accepted value for the temperature closest to the average temperature of the warm water you tested. Calculate a percentage difference from the accepted value.

ACCEPTED VALUES

Temperature (°C)	Specific Heat Capacity J/(g x °C)
50	4.182
55	4.183
60	4.185
65	4.188
70	4.191

LAB 3. The equipment used in most high school laboratories allows results to be determined that are within ten percent of the accepted values. Does your result fall within this range?

MODULE 1: LESSON 5 ASSIGNMENT

Part 1—Lab: Molar Heat of Neutralization

Data

1. Record the following data collected during the investigation:

initial temperature of $H_2SO_4(aq)$	
initial temperature of NaOH(aq)	
average initial temperature of solutions	
final temperature of solutions	

Analysis

1. Calculate the molar heat of reaction for the NaOH(aq) using the data obtained from the experiment. Show all your work.

2. Calculate a percent difference for the value you obtained from the experiment to the widely accepted value for the molar heat of neutralization of sodium hydroxide, -57 kJ/mol.

Part 2—Evaluating Different Fuels

1. The table below provides information about different types of fuels that can be used for cooking at a campsite. Examine the information in the table. Select which fuel is most suitable for your ecotour.

   Justify your choice by making specific reference to the data provided. You will be assessed on how well you support your opinion, including explaining relevant scientific, technological, ecological, and other perspectives.

Fuel	Kerosene	Ethanol	Methanol	Wood	Propane	Biogas (Methane)
State	(l)	(l)	(l)	(s)	(g)	(g)
$\Delta_c H_m$ (kJ/mol)	-8.33×10^3	-1.37×10^3	–728	-2.51×10^3	-2.22×10^3	–891
Molar Mass (g/mol)	approx. 110–226	46.08	32.05	assume cellulose $(C_6H_{10}O_5)_n$ 162.16	44.11	16.05
Toxicity	poisonous		poisonous		poisonous	poisonous
Relative Stability	high	high	high	high	low	low
Relative Cleanliness When Burning	low	high	high	low	high	moderate (corrosive combustion products)
Source	petroleum	fermented plant matter	petroleum	deadfall in area surrounding campsite	petroleum	from biogas reactor containing decaying organic matter
Additional Information					stored at high pressure in special containers	stored at low pressure in large bladders

2. Describe an experiment that could have been used to determine the values for the molar enthalpy of combustion for each of the different fuels listed in the table. Include which measurements must be taken and describe the procedures you would use to ensure the safe handling of the materials (equipment and chemical substances) used in the experiment.

MODULE 1: LESSON 7 ASSIGNMENT

Lesson 7 Lab: Applying Hess' Law

Data

1. Record all data collected during the experiment in an organized table.

Analysis

1. Calculate the molar enthalpies of reaction for the reactions occurring in Parts A and B.

2. Go to the introduction to "Investigation 11.3" on page 517 of the textbook. Use the information provided to arrange the three chemical reaction equations in order so that they can be combined to create the reaction equation for the combustion of magnesium.

3. Use your answer to Analysis question 1 to calculate the enthalpy of combustion for magnesium.

4. Calculate the percent difference between the answer to Analysis question 3 and the accepted value, –601.6 kJ/mol.

MODULE 1: LESSON 8 ASSIGNMENT

Lesson 8 Assignment: Concepts from Lessons 6, 7, and 8

1. Calculate the enthalpy of reaction for the combustion of ethene.

2. Use your answer to question 1 to answer the following questions.

a. Express the enthalpy of reaction calculated in question 1 as a molar enthalpy of reaction per mole of carbon dioxide.

b. Express the reaction enthalpy calculated in question 1 by writing it as a term in the balanced chemical equation.

c. Draw an energy diagram to describe the change in chemical potential energy that occurs in this reaction. Label important parts of your diagram.

d. Indicate whether the reaction is exothermic or endothermic, and justify your answer by making reference to relevant concepts.

3. Use the information contained in "Lab Exercise 11.B" on page 506 in the textbook to answer the following questions.

   a. Use the reaction equations and reaction enthalpies shown in the introduction section to calculate the following:

   - a reaction enthalpy for the combustion of pentane
   - a molar enthalpy of combustion for pentane

   b. Use the calorimetric data provided to calculate a molar enthalpy of combustion for pentane.

   c. Calculate a percentage difference between the value calculated in question 2.a and the value calculated in question 2.b.

4. Use the information contained in "Lab Exercise 11.D" on page 513 in the textbook to answer the following questions.

   a. Use the data collected by experiment to calculate a molar enthalpy of reaction for methanol.

   b. Use the value calculated in question 4.a. to calculate the standard molar enthalpy of formation for methanol.

   c. Calculate a percentage difference between the value calculated in question 4.b and the value for the standard molar enthalpy of formation for methanol shown in your Chemistry Data Booklet.

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